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2	541	347/104.ccls.	USPAT	2003/09/15 14:48
1	76	347/95.ccls.	USPAT	2003/09/15 15:28
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5	338	347/101.ccls.	USPAT	2003/09/15 15:49
6	221	347/5.ccls.	USPAT	2003/09/15 15:49
-	5904	399/111	USPAT; US-PGPUB; EPO; JPO	2003/09/15 12:21
-	0	399/111.ccls.	USPAT	2003/09/11 12:38
-	490	399/111.ccls.	USPAT	2003/09/11 12:39
-	4896	399/111.ccls.	EPO; JPO	2003/09/11 12:39
-	260	399/111.ccls.	EPO	2003/09/11 12:50
-	3	atsushi with sogami	EPO	2003/09/11 12:50
-	192	atsushi with sogami	JPO; DERWENT	2003/09/11 13:08
-	32	347/16.ccls.	JPO; DERWENT	2003/09/11 13:10
-	189	347/16.ccls.	USPAT	2003/09/11 14:24
-	667	347/5	USPAT	2003/09/11 15:41
-	496	347/2	USPAT	2003/09/11 15:09
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-	292	347/4	USPAT	2003/09/11 15:15
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-	154	347/5	EPO; JPO	2003/09/11 15:59
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-	2574	358/300	USPAT; US-PGPUB; EPO; JPO	2003/09/12 09:44
-	2199	358/401	USPAT; US-PGPUB; EPO; JPO	2003/09/12 09:44
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-	1538	358/296.ccls.	USPAT	2003/09/12 09:47
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-	373	358/296.ccls. and (inkjet or (ink adj jet))	USPAT	2003/09/12 10:22
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-	1710559	multiple or plurality	USPAT	2003/09/12 11:11
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-	8	("5119473" "5124809" "5179637" "5208640" "5428464" "5467434" "5550957" "5596416").PN.	USPAT	2003/09/12 11:51
-	1061	347/104	USPAT	2003/09/12 13:33
-	497	347/16	USPAT	2003/09/12 13:33
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-	293	347/102.c ls.	USPAT	2003/09/15 13:05

-	11051	lin.in.	USPAT	2003/09/15
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-	58	lin.in. and 347/\$.c ls.	USPAT	2003/09/15
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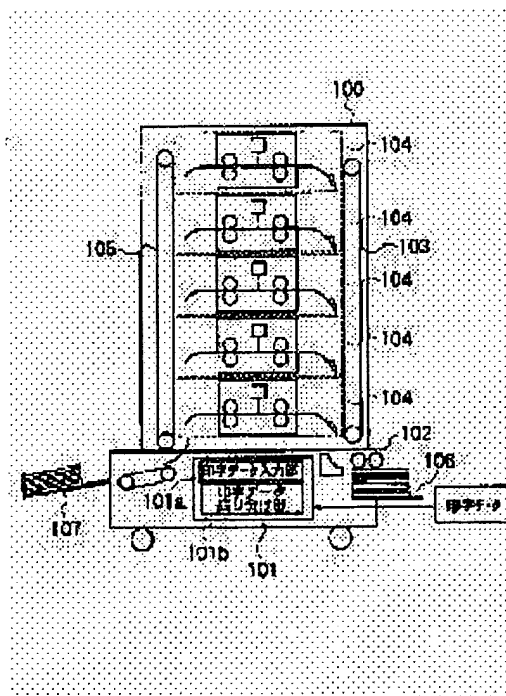
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(54) PRINTER AND METHOD OF CONTROLLING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a printer having a plurality of printing sections and a method of controlling the same wherein a paper discharge section can be unified and a collating operation can be eliminated and the high speed printing can be performed.

SOLUTION: This printer comprises the plurality of printing sections each having at least a print head for performing the printing on a printing paper based on inputted print data and a paper feeding mechanism for the printing paper. The printer further comprises a print data input section 101a for inputting print data for printing on multiple sheets of printing paper, a print data distributing section 101b that distributes the print data to each of the printing sections by a unit of page, a paper supplying/conveying section 103 for conveying the sheets of printing paper to each of the printing sections and a paper discharging/ conveying section 105 for conveying the sheets of printing paper discharged from the plurality of printing sections.



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CLAIMS

[Claim(s)]

[Claim 1] The printer equipped with two or more printing sections which have the print head which performs printing processing to a print sheet based on the inputted printing data which are characterized by providing the following, and the carriage of the print sheet concerned at least. A printing data input means to input the multi-number-of-sheets printing data printed on the aforementioned print sheet. A printing data distribution means to distribute the aforementioned multi-number-of-sheets printing data to each aforementioned printing section per page. A feed conveyance means to convey a print sheet to each of two or more aforementioned printing sections. A delivery conveyance means to convey the print sheet discharged from each of two or more aforementioned printing sections.

[Claim 2] It is the printer carry out having a printing time calculation means calculate the time which printing processing of each page of the aforementioned multi-number-of-sheets printing data takes the aforementioned printing data distribution means in a printer according to claim 1, and a printing time regulation means determine the distribution sequence and the printing timing of multi-number-of-sheets printing data to each aforementioned printing section based on the calculation result of the aforementioned printing time calculation means as the feature.

[Claim 3] The printer characterized by having a printing start timing regulation means to change the printing start timing of each printing section gradually so that the print sheet discharged from each printing section in the aforementioned delivery conveyance means may not lap in a printer according to claim 2.

[Claim 4] The printer carry out having a rearrangement result storage means the aforementioned printing time regulation means rearranges the aforementioned multi-number-of-sheets printing data into the large paginal order of the time which printing processing takes in a printer according to claim 2, and memorize a rearrangement result, and the distribution sequence determination means distributed in the aforementioned multi-number-of-sheets printing data to the aforementioned printing section with reference to the aforementioned rearrangement result as the feature.

[Claim 5] It is the printer characterized by having a delivery timing regulation means to adjust the timing which discharges a form from the aforementioned printing section to a delivery conveyance means so that the paginal order foreword of the print sheet with which the aforementioned printing data distribution means is discharged from each of two or more aforementioned printing sections in a printer according to claim 1 may not be confused.

[Claim 6] It is the printer characterized by distributing printing data serially sequentially from the printing section in which printing ended the aforementioned printing data distribution means in the printer according to claim 1.

[Claim 7] It is the printer characterized by distributing printing data on the basis of printing end time to each printing section so that the aforementioned printing time regulation means may serve as sequence of a request of printing end sequence in a printer according to claim 2.

[Claim 8] The printer characterized by having a printing mode selection means to have two or more printing data distribution meanses, and to choose one of two or more aforementioned printing data

distribution means in a printer according to claim 1.

[Claim 9] It is the printer which each aforementioned printing section is constituted free [attachment and detachment] to the aforementioned printer in a printer according to claim 1, and is characterized by the aforementioned printing data distribution means performing the aforementioned distribution processing to the printing section with which the aforementioned printer is equipped.

[Claim 10] The control method of a printer of carrying out having the step which inputs the multi-number-of-sheets printing data which are the control method of the printer equipped with two or more printing sections which have the print head which performs printing processing to a print sheet based on the inputted printing data, and the carriage of the print sheet concerned at least, and print on the aforementioned print sheet, and the step which distribute the aforementioned multi-number-of-sheets printing data to each aforementioned printing section per page as the feature.

[Claim 11] The control method of the printer characterized by having the step which calculates the time which printing processing of each page of the aforementioned multi-number-of-sheets printing data takes in the control method of a printer according to claim 10, and determining the distribution sequence and printing timing of multi-number-of-sheets printing data to each aforementioned printing section based on the aforementioned calculation result.

[Claim 12] The control method of the printer characterized by changing the printing start timing of each printing section gradually so that the print sheet discharged from each printing section may not lap in the control method of a printer according to claim 11.

[Claim 13] The control method of the printer characterized by having the step which rearranges the aforementioned multi-number-of-sheets printing data into the large paginal order of the time which printing processing takes in the control method of a printer according to claim 11, and memorizes a rearrangement result, and the step which distributes the aforementioned multi-number-of-sheets printing data to the aforementioned printing section with reference to the aforementioned rearrangement result.

[Claim 14] The control method of the printer characterized by adjusting the timing which discharges a print sheet from the aforementioned printing section so that the paginal order foreword of the print sheet discharged from each of two or more aforementioned printing sections may not be confused in the control method of a printer according to claim 10.

[Claim 15] The control method of the printer characterized by distributing printing data serially in the control method of a printer according to claim 10 sequentially from the printing section which printing ended.

[Claim 16] The control method of the printer characterized by distributing printing data on the basis of printing end time to each printing section in the control method of a printer according to claim 11 so that printing end sequence may turn into desired sequence.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the printer equipped with two or more print heads, and its control method.

[0002]

[Description of the Prior Art] A thing called the cluster printer which shortens the creation character time of printed matter is proposed by distributing printing data using two or more sets of printers to two or more of these [which were connected to the network from one personal computer] sets of printers, when creating a lot of printed matter, and operating two or more sets of printers in parallel.

[0003] Moreover, the printer which realizes high-speed printing is carried by JP,11-348385,A etc. by arranging two or more printing sections in parallel, distributing printing data, and operating these printing sections in parallel. According to this, compared with the printer which accepted the one printing section of the same performance and used it, it can print at high speed in operating two or more printing sections in parallel.

[0004]

[Problem(s) to be Solved by the Invention] However, according to the above printers, there was a trouble which is described below. That is, KORETO [the printing duration for every page is calculated, since a delivery unit is in each printer, respectively when the printing data for every page are distributed to each printer so that printing efficiency may increase (total printing time becomes short like), printed matter is collected to each delivery unit, and / a handicraft] since an oak or the paginal order of printed matter has come apart if there are no peripheries. Although it is good if it does not distribute in order to make paginal order etc. intelligible, a print speed will become slow if a page with much amount of data concentrates on the one printing section.

[0005] Moreover, in a printer with two or more printing sections by one apparatus, in case feeding-and-discarding paper of the form is carried out to each printing section, the timing control of a printing start and a printing end is needed.

[0006] Moreover, in a printer with two or more printing sections by one apparatus, if the timing of the print sheet which printing finished as each printing section differs, control of delivery will take time and effort.

[0007] Moreover, as a method of distributing of distributing the printing data for every page to each printing section, since the optimal method changes by the number of pages of a printing manuscript, number of copies, and the printing duration of each page, it is difficult to make the optimal way of distributing for a user choose.

[0008] this invention aims at offering the printer which is made in view of the above, collects a delivery unit to one in the printer which has two or more printing sections, and loses the KORETO work by the user, and enables high-speed printing processing, and its control method.

[0009]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, a printer according to

claim 1 It is the printer equipped with two or more printing sections which have the print head which performs printing processing to a print sheet based on the inputted printing data, and the carriage of the print sheet concerned at least. A printing data input means to input the multi-number-of-sheets printing data printed on the aforementioned print sheet, A printing data distribution means to distribute the aforementioned multi-number-of-sheets printing data to each aforementioned printing section per page, It is characterized by providing a feed conveyance means to convey a print sheet to each of two or more aforementioned printing sections, and a delivery conveyance means to convey the print sheet discharged from each of two or more aforementioned printing sections.

[0010] According to the above-mentioned composition Since the delivery unit is collected by one in addition to printing efficiency being good when it distributes to each printing section and the printing data for every page are printed so that printing efficiency may become good, printed matter does not come out scatteringly to two or more delivery units, and a user becomes possible [receiving printed matter smoothly].

[0011] A printer according to claim 2 is a printer according to claim 1, and the aforementioned printing data distribution means carries out providing a printing time calculation means calculate the time which printing processing of each page of the aforementioned multi-number-of-sheets printing data takes, and a printing time regulation means determine the distribution sequence and the printing timing of multi-number-of-sheets printing data to each aforementioned printing section based on the calculation result of the aforementioned printing time calculation means as the feature.

[0012] A printer according to claim 3 is a printer according to claim 2, and it is characterized by providing a printing start timing regulation means to change the printing start timing of each printing section gradually so that the print sheet discharged from each printing section in the aforementioned delivery conveyance means may not lap.

[0013] According to the above-mentioned composition, since it conveys one sheet of form at a time in the case of form conveyance of each feed delivery, two or more sheets of forms are not simultaneously sent to the form conveyance section, and the form transfer control of feed delivery can be performed easily.

[0014] Moreover, KORETO since the paginal order foreword of the printed matter held in the delivery tray has gathered when printed matter with a paginal order foreword is printed and printing is completed.

[0015] A printer according to claim 4 is a printer according to claim 2, and the aforementioned printing time regulation means rearranges the aforementioned multi-number-of-sheets printing data into the large paginal order of the time which printing processing takes, and it carries out providing a rearrangement result storage means memorize a rearrangement result, and the distribution sequence determination means distributed in the aforementioned multi-number-of-sheets printing data to the aforementioned printing section with reference to the aforementioned rearrangement result as the feature.

[0016] A printer according to claim 5 is a printer according to claim 1, and the aforementioned printing data distribution means is characterized by providing a delivery timing regulation means to adjust the timing which discharges a form from the aforementioned printing section to a delivery conveyance means so that the paginal order foreword of the print sheet discharged from each of two or more aforementioned printing sections may not be confused. A printer according to claim 6 is a printer according to claim 1, and the aforementioned printing data distribution means is characterized by distributing printing data serially sequentially from the printing section which printing ended. A printer according to claim 7 is a printer according to claim 2, and the aforementioned printing time regulation means is characterized by distributing printing data on the basis of printing end time to each printing section so that printing end sequence may turn into desired sequence. A printer according to claim 8 is a printer according to claim 1, has two or more printing data distribution meanses, and is characterized by having a printing mode selection means to choose one of two or more aforementioned printing data distribution meanses. A printer according to claim 9 is a printer according to claim 1, each aforementioned printing section is constituted free [attachment and detachment] to the aforementioned printer, and the aforementioned printing data distribution means is characterized by performing the

aforementioned distribution processing to the printing section with which the aforementioned printer is equipped.

[0017] The control method of a printer according to claim 10 is the control method of the printer equipped with two or more printing sections which have the print head which performs printing processing to a print sheet based on the inputted printing data, and the carriage of the print sheet concerned at least, and it carries out having the step which inputs the multi-number-of-sheets printing data which print on the aforementioned print sheet, and the step which distribute per page in the aforementioned multi-number-of-sheets printing data to each aforementioned printing section as the feature.

[0018] Since the latency time concerning printing time decreases as much as possible according to the above-mentioned composition, printing efficiency improves.

[0019] Moreover, printing efficiency becomes good, so that the difference of the time which especially printing for every page takes is large.

[0020] The control method of a printer according to claim 11 is the control method of a printer according to claim 10, has the step which calculates the time which printing processing of each page of the aforementioned multi-number-of-sheets printing data takes, and is characterized by determining the distribution sequence and printing timing of multi-number-of-sheets printing data to each aforementioned printing section based on the aforementioned calculation result.

[0021] The control method of a printer according to claim 12 is the control method of a printer according to claim 11, and it is characterized by changing the printing start timing of each printing section gradually so that the print sheet discharged from each printing section may not lap.

[0022] The control method of a printer according to claim 13 is the control method of a printer according to claim 11, rearranges the aforementioned multi-number-of-sheets printing data into the large paginal order of the time which printing processing takes, and is characterized by having the step which memorizes a rearrangement result, and the step which distributes the aforementioned multi-number-of-sheets printing data to the aforementioned printing section with reference to the aforementioned rearrangement result.

[0023] The control method of a printer according to claim 14 is the control method of a printer according to claim 10, and it is characterized by adjusting the timing which discharges a print sheet from the aforementioned printing section so that the paginal order foreword of the print sheet discharged from each of two or more aforementioned printing sections may not be confused. The control method of a printer according to claim 15 is the control method of a printer according to claim 10, and is characterized by distributing printing data serially sequentially from the printing section which printing ended. The control method of a printer according to claim 16 is the control method of a printer according to claim 11, and it is characterized by distributing printing data on the basis of printing end time to each printing section so that printing end sequence may turn into desired sequence.

[0024]

[Embodiments of the Invention] Hereafter, it explains, referring to a drawing about the operation form of this invention.

[0025] [Form 1 of operation] Drawing 1 is explanatory drawing for the composition of the multilayer printer concerning the form of operation of the 1st of this invention being shown. In drawing, 100 is the main part of a multilayer printer. A control section 101, The medium tray 106 which holds a print sheet, and the feed section 102 which holds a print sheet in a medium tray 106, and sends out a print sheet one by one, The feed conveyance section 103 which conveys a print sheet in two or more printing sections 104, and two or more printing sections 104 as a means to print to a print sheet, It has the delivery conveyance section 105 which conveys the print sheet sent out from the printing section 104 on the delivery tray 107, and the delivery tray 107 which holds the print sheet sent out from the delivery conveyance section 105. Here, the above-mentioned feed conveyance section 103 and the delivery conveyance section 105 may establish the mechanism in which a print sheet sticks to a conveyance belt by suction, when the printing section is the mechanism of every length like this operation form.

[0026] The above-mentioned control section 101 divides printing data input section 101a into which the

printing data which carry out image formation on a print sheet are inputted, and printing data per page, and consists of printing data distribution section 101b which distributes the printing data outputted to each printing section per page of printing data.

[0027] The feed separation presser foot stitch tongue 201 which incorporates the print sheet which could rotate freely focusing on axis-of-rotation 201a as the above-mentioned printing section 104 showed drawing 2 with this operation form, and was sent out from the feed conveyance section 103 in the printing section, The 1st form-feed guide plate 202 as auxiliary means which convey a print sheet on the feed roller 203, The feed roller 203 which feeds paper to a print sheet according to printing speed, and the print head 204 printed to a print sheet, It consists of a delivery roller 205 which sends out a print sheet to the delivery conveyance section 105, and the 2nd form-feed guide plate 206 as auxiliary means which convey a print sheet in the delivery conveyance section 105, and has the function which prints to the print sheet of one sheet.

[0028] Moreover, with this operation gestalt, although the above-mentioned printing section 104 is made into the state where it was fixed to the main part 100 of a multilayer printer, as shown in drawing 3, it may consider as the composition which consists of a printing section unit 300, and you may enable removal of it one [at a time] from a main part 100 (drawing 4). At this time, the above-mentioned printing section unit 300 can consist of a handle 301 for printing section unit ejection, a printing section unit ejection extension rail 302, etc. as a means for detaching and attaching from the main part 100 of a multilayer printer, as shown in drawing 5.

[0029] Furthermore, when it locks in the midst which is printing so that a printing section unit cannot be removed from a main part, and printing is completed or interrupted to it, the mechanism in which a lock is canceled may be established and a mechanism which does not cause failure of equipment and a trouble may be established.

[0030] Since the detail inside the printing section unit 300 is the same as that of the above-mentioned printing section 104, explanation is omitted.

[0031] Moreover, although the five printing sections 104 or the printing section unit 300 should be carried in the multilayer printer main part 100 with this operation form, the number of the printing section 104 or the printing section units 300 is good still more mostly or at least.

[0032] As shown in drawing 6, with this operation form, the above-mentioned control section 101 The printing demand terminal 401, The processing which incorporates the printing data of the printing demand which has a control unit 402, the printing section 104 or the printing section unit 300, connection, and communication facility, and is inputted from the exteriors, such as a personal computer, or many number of sheets, The multi-number-of-sheets printing data incorporated from the exterior are disassembled for every page, and processing which transmits the printing data for every page to each printing section, and conveyance control processing from feeding of a print sheet to delivery are performed. In addition, with the printing data of many number of sheets here, 1-page many number of copies, multi-page 1 number of copies, and multi-**** number of copies are included.

[0033] The above-mentioned printing demand terminal 401 can transmit a printing demand and printing data, such as a personal computer, a scanner, a memory medium, a communication line, a radio machine, and personal digital assistants (PDA, digital camera, etc.), to a printer.

[0034] The above-mentioned control unit 402 is connected with the mode selection section 403 which chooses whether automatic or hand control performs operation about printing control. At this example, although the mode selection section is shown as a button, you may set up the mode by transmitting a mode selection signal to a control section from the exteriors, such as a personal computer.

[0035] Next, operation of the multilayer printer constituted as mentioned above is explained.

[0036] First, a control section 101 receives a printing demand and printing data from the printing demand terminal 401.

[0037] Next, a control section 101 sends a control signal to the feed section 102 and the printing section 104 according to the printing demand and printing data which were received. The feed section 102 feeds paper at a time to one sheet of print sheet set to the medium tray 106 according to the aforementioned control signal, and sends it to the feed conveyance section 103. The feed conveyance section 103

conveys the print sheet sent from the feed section 102 to each printing section 104. Here, with this operation gestalt, it has the mechanism in which do not perform control to which printing section of the printing section which has more than one to convey a print sheet, by the feed conveyance section 103 side, but a print sheet is incorporated by each printing section 104 side.

[0038] That is, each printing section incorporates the form sent from the feed conveyance section 103 into the printing section 104 by rotating the feed separation presser foot stitch tongue 201 focusing on axis-of-rotation 201a according to the control signal from a control section. The incorporated print sheet is guided at the 1st form-feed guide plate 202, and is incorporated by the feed roller 203. According to the control signal from a control section 101, the ejection of the feed roller 203 is carried out according to printing speed, and printing is performed to a print sheet by the print head. The printed print sheet is conveyed with the delivery roller 205, is guided at the 2nd form guide feed plate 206, and is sent to the delivery conveyance section 105. The delivery conveyance section 105 conveys the print sheet sent from each printing section 104 to the delivery tray 107. The print sheet sent from the delivery conveyance section 105 is accumulated on the delivery tray 107 one by one considering the printing side as the upper surface.

[0039] According to the multilayer printer which starts the gestalt of operation of the 1st of this invention as explained above Since in addition to printing efficiency being good printed matter does not come out scatteringly to two or more delivery units and it is together put by one delivery unit when it distributes to each printing section and the printing data for every page are printed so that printing efficiency may become good, a user becomes possible [receiving printed matter smoothly].

[0040] [Gestalt 2 of operation] This operation gestalt 2 describes the example which performs printing control processing in the case of printing printed matter with a paginal order foreword in the multilayer printer of the operation gestalt 1 mentioned above. Fundamental composition and fundamental operation are the same as that of the gestalt 1 of operation mentioned above. By this example, for simplification, the five printing sections are used in a multilayer printer, and the case where the 1 section of printed matter which has 15 pages is printed is stated.

[0041] If the time concerning printing prints by assigning a long page and a short page to each printing section as shown in a timing chart 7 when printing printed matter with a paginal order foreword, the printing section which is printing many short pages of printing time will pass the long page of printing time. Therefore, when printing is completed, the fault that the paginal order foreword of the printed matter held in the delivery tray will be different arises.

[0042] As shown in a timing chart 7, before finishing printing 11 pages in the printing section 1, printing (15 pages and 10 pages) has finished it with the printing section 5 as this example. In order to make it such fault not arise, since the thing with long printing time becomes 11 pages, 6 pages, and 1 page, as shown in a timing chart 8, according to the example of a timing chart 7, with the gestalt of this operation, all other pages print by putting in a standby time, for example so that it may suit at printing time (11 pages, 6 pages, and 1 page).

[0043] Although a standby time is prepared in one portion of the printing processes, it has established the standby time after printing here. If a standby time is established after printing, it can appropriate for the drying time of ink and is more effective.

[0044] Next, the above-mentioned timing explains the control method for performing printing processing using the flow chart of drawing 9 and drawing 10. Flow chart drawing 9 is the main flow of printing processing, and flow chart drawing 10 is the sub routine of printing processing.

[0045] With this operation gestalt, the printing time for every page is beforehand calculated from the rate of printing of printing data, and it adjusts so that the printing time of other printing sections may become the same based on this printing time at the longest printing section of printing time.

[0046] Steps S501-S503 are the preparation stages of printing, and Steps S504-S512 are stages which distribute all printed matter pages to the printing section, and print them.

[0047] First, in Step S501, a control section 101 receives a printing demand and printing data from the printing demand terminals 401, such as a personal computer.

[0048] Next, in Step S502, a control section 101 divides the received printing data into the data for

every page, in Step S503, the variable j of the page showing the remaining printing number of sheets is set as the total number of sheets n of a print sheet (number of pages x number of copies of the one section), and the variable t of a loop count is set as initial value 0.

[0049] Next, in Step S504, it considers as the number [number / of the printing sections usable now] of the printing sections which perform a constant m and print Variable k this time, if the remaining printing number of sheets j is larger than several m of the printing section, several m of the printing section will be substituted for Variable k (S505), if the remaining printing number of sheets j is smaller than several m of the printing section, it will remain in Variable k and the printing number of sheets j will be

[0050] Next, in Step S507, page data are assigned to the printing section of an upper case sequentially from the end of a page sequentially from the printing section of the lower berth. This is for changing into the state where paginal order sorted, when a print sheet is printed and it holds in a delivery tray.

[0051] Next, in Step S508, a control section 101 calculates the printing time concerning printing of each page, and substitutes for variable h (t) the longest printing time in the page assigned to the printing section in Step S509. Moreover, the number with the longest printing time of the printing section is set to a.

[0052] Next, in Step S510, a print head prints to a printing form.

[0053] Next, in Step S511, the number of sheets k printed this time is subtracted from the variable j of a page. Moreover, 1 is added to a loop count.

[0054] Next, in Step S512, when there is a page which has not printed yet, it returns to S504 and printing is repeated. If all printing has finished, it will consider as a printing end.

[0055] Next, the detail of the sub routine of the above-mentioned step S510 is shown in flow chart drawing 10.

[0056] Steps S521-S524 are the flows for feeding one sheet of print sheet at a time to each printing section sequentially from [section / feed conveyance / 104] the upper case of the printing section which a multilayer printer uses.

[0057] First, in Step S521, several k of the printing section which performs several m to printing of the printing section is subtracted by making Variable i into a printing section number, and the number added one is substituted for Variable i. As for a printing section number, a number shall be shaken by ascending order from the upper case of the printing section of a multilayer printer main part here in the lower berth.

[0058] Next, in Step S522, the feed section feeds a print sheet to the printing section of the printing section number i inputted at the aforementioned step S521.

[0059] Next, in Step S523, 1 is added to the printing section number i, if the printing section number i is smaller than several m of the printing section in Step S524, it will return to Step S522 and feeding will be repeated.

[0060] Next, if one sheet is fed at a time to all the printing sections used by the flow of the above-mentioned steps S521-S524, in step S525a, S525b, S525c, and S525d, each printing section will start printing simultaneously.

[0061] Next, supposing the printing section with the longest printing time in the page assigned to the printing section at the aforementioned step S509 is the printing section a, the printing section a prints to usual (S525c), and it is waiting for it until the other printing section (S526a, S526b, S526d) h (t) Passes from a printing start.

[0062] Next, Steps S527-S530 are the flows for delivering paper at a time to one sheet of print sheet printed by the delivery conveyance section 105 in each printing section sequentially from the lower berth of the printing section which a multilayer printer uses.

[0063] First, in Step S527, several m of the printing section is substituted for the printing section number i, and the print sheet printed from the printing section i is delivered to the delivery conveyance section in Step S528.

[0064] Next, in Step S529, 1 is subtracted from a printing section number, several k of the printing section in which the printing section number i performs several m to printing of the printing section in Step S530 is subtracted, and in being larger than the number added one, it returns to Step S528 and

repeats delivery, and in being smaller than the number added one, it considers as a delivery end.

[0065] Since the time which printing takes becomes the same in all the printing sections according to the control method of the multilayer printer concerning the form of operation of the 2nd of this invention as explained above, it becomes easy to carry out timing control of delivery. Moreover, KORETO since the paginal order foreword of the printed matter held in the delivery tray has gathered when printed matter with a paginal order foreword is printed and printing is completed.

[0066] Moreover, since it is not necessary to operate feeding / delivery mechanism during the composition which performs feed delivery collectively, then printing, it is power saving.

[0067] [Form 3 of operation] With this operation form 3, although fundamental composition and fundamental operation are the same as that of the form 1 of operation mentioned above, the points of adjusting the timing of a printing start gradually in each printing section differ. That is, adjustment of shifting the timing of a printing start gradually for every printing section is performed. the amount to shift -- then (the total feeding-and-discarding paper time / k), well (time taken for all the printing sections to carry out feeding-and-discarding paper of the total feeding-and-discarding paper time), a form is discharged by the delivery conveyance section only from the one printing section, and paper is continuously delivered at a time to one sheet of print sheet at a fixed interval by the delivery unit In addition, the total feeding-and-discarding paper time turns into time to change with the numbers and print sheet sizes of the printing section. By this example, for simplification, the five printing sections are used in a multilayer printer, and the case where the 1 section of printed matter which has 15 pages is printed is stated.

[0068] Below, the above-mentioned timing explains the control method for performing printing processing using the flow chart of drawing 12 .

[0069] Since the main flow is the same as the gestalt 2 of operation, explanation is omitted and explains only the sub routine of the flow (S510) of printing.

[0070] First, in Step S541, the variable i of a printing number is set as several m of the printing section. Here, the variable i which shows a printing number is initialized by m.

[0071] Next, in Step S542, when printing time is shorter than the total feeding-and-discarding paper time, longest at (S542-YES) and Step S543 printing time h (t) is made into the total feeding-and-discarding paper time, and when printing time is longer than the total feeding-and-discarding paper time, h (t) is not changed (S542-NO). It waits so that the feeding-and-discarding paper of each printing section may not overlap in Step S545 (between the total feeding-and-discarding paper time / k).

[0072] A timing chart 11 is what applied the form of this operation to the same printing data as the operation form 2, and feeding-and-discarding paper is performed one sheet of form at a time in order.

[0073] Next, in Step S546, the feed section and the feed conveyance section feed a print sheet to the printing section i, and start printing to a print sheet in the printing section i in Step S547.

[0074] Next, in Step S548, if a print head starts printing, it will print by background processing, and if it h (t) Passes from a printing start, paper will be similarly delivered by background processing.

[0075] Next, in Step S549, 1 is subtracted from the variable i of a printing number so that the printing section which prints may turn into the printing section on one.

[0076] Next, in Step S550, it counts upwards sequentially from the lowermost printing section, and, in below the k-th printing section, returns at Step S542, and the printing section i considers as a printing end, in being larger than the k-th printing section.

[0077] Since it conveys one sheet of form at a time in the case of form conveyance of each feed delivery according to the multilayer printer concerning the form of operation of the 3rd of this invention as explained above, two or more sheets of forms are not simultaneously sent to the form conveyance section, and the form transfer control of feed delivery can be performed easily.

[0078] Moreover, KORETO since the paginal order foreword of the printed matter held in the delivery tray has gathered when printed matter with a paginal order foreword is printed like the form of operation of the 2nd of this invention and printing is completed.

[0079] [Form 4 of operation] With this operation form 4, although fundamental composition and fundamental operation are the same as that of the form 1 of operation mentioned above, the time

concerning printing is calculated beforehand and the points of distributing the printing data for every page to each printing section so that efficiency may become good differ. That is, printing performs adjustment of distributing a printing job sequentially from the long page of the time concerning printing in the printing section which finished early. By this example, the five printing sections are used in a multilayer printer, and when printing the 1 section of printed matter which has 15 pages, the timing chart 13 of an about is shown.

[0080] Below, the above-mentioned timing explains the control method for performing printing processing using the flow chart of drawing 14 and drawing 15.

[0081] Although the main flow (drawing 14) is the same as that of the form 2 of operation, calculation of the longest printing time in Step S509 is not performed.

[0082] First, in Step S561, the time which printing takes the page data distributed to the printing section sorts a control section 101 in long order, and it substitutes the page number for S (i).

[0083] Next, in Step S562, in not being immediately after printing data reception, the number of the printing section is substituted for the turn which printing under present printing finishes early at U (i) (S563), next it is referred to as U(i) = i in immediately after printing data reception (S564), in Step S565, a control section 101 substitutes initial value 1 for the variable i of a printing number, and it initializes a loop variable.

[0084] Next, in Step S566, if waiting (S567) and printing end the printing end of printing section U (i) in not being immediately after printing data reception, the printing section will deliver paper (Step S568), and, in immediately after printing data reception, will progress to Step S569.

[0085] Next, in Step S569, the feed section and the feed conveyance section feed paper to printing section U (i).

[0086] Next, in Step S570, a print head starts printing by printing section U (i), and printing processing is performed in the background (S571).

[0087] Next, in Step S572, a control section 101 adds 1 to the loop variable i.

[0088] Next, in Step S573, when the data distributed to the printing section remain, it returns to Step S566, and when the data distributed to the printing section do not remain, it considers as a printing end.

[0089] Since the latency time concerning printing time decreases as much as possible according to the control method of the multilayer printer concerning the form of operation of the 4th of this invention as explained above, printing efficiency improves. Moreover, printing efficiency becomes good, so that the difference of the time which especially printing for every page takes is large.

[0090] [Gestalt 5 of operation] The gestalt 5 of operation of this invention is explained below. Since the printing time which one sheet takes differs greatly when printing the printed matter with which the color page and monochrome page were intermingled, the printed matter with which the document page and the picture page were intermingled, in the gestalt 2 grade of operation, rate controlling of the printing time will be carried out with the printed matter which time requires most.

[0091] Then, printing is serially started sequentially from the printing section which printing ended, and the printing control art by the serial printing method which shortens the time which printing takes by reducing the standby time of the printing section is explained. Drawing 16 is a timing chart when using it the five printing sections, when the 10 sections of 12-page printed matter with which printing time differs are printed, and performing parallel processing by the printing method serially.

[0092] The flow of the printing art by the printing method is serially shown in the flow chart of drawing 17. When printing the number m of printing pages, printing number of copies n, and the total printing number of sheets mn, distributed processing shall be performed using the k printing sections.

[0093] First, let the numeric value which subtracted 1 from the total printing number of sheets be the loop value M by the side of a control section (S650).

[0094] Next, the printing section which is in a standby state among a certain printing sections to 1-k is searched sequentially from the printing section 1 (S651-S654).

[0095] If it checks that the printing section K is in a standby state (S654-YES), a control section sets to P the number which added 1 to the surplus which $M - n$, and sends out the page [Pth] image data to the printing section K (S655).

[0096] Next, each printing section receives and prints the image data transmitted from the control section by S655 (S660, S661).

[0097] Next, in Step S663, when printing is completed in each printing section and the front page has ended printing, paper is delivered to a print sheet (S664), and it will be in a standby state to printing of the following page (S658). When the front page has not ended printing, the printing section stands by until printing of a front page is completed (S662).

[0098] The control section assigns printing data to the printing section which printing ended by processing to the above steps S658-S664 one by one (S655).

[0099] Finally, in Steps S656 and S657, the above-mentioned operation is repeated from the last page to the 1st page.

[0100] As explained above, in order to distribute printing data to the printing section which changed into the standby state in order according to the control method of the multilayer printer concerning the gestalt of operation of the 5th of this invention, it is hard to produce useless time.

[0101] [Gestalt 6 of operation] The gestalt 6 of operation of this invention is explained below.

[0102] Drawing 18 is a timing chart when using the five printing sections, when the 10 sections of 12-page printed matter with which printing time differs are printed, and performing printing and criteria apportion design **** parallel processing.

[0103] The flow of the printing art by printing and the criteria apportion design is shown in the flow chart of drawing 19. When printing the number m of printing pages, printing number of copies n , and the total printing number of sheets mn , distributed processing shall be performed using the k printing sections. At this time, addition printing time of eye alpha watch is set to S_{α} among the k printing sections.

[0104] First, in Step S701, the variable j which shows addition printing time $S_{\alpha}-S_k$ and distribution sequence is set as initial value 0.

[0105] Next, in Step S702, a control section predicts the printing time t_1-t_m of each 1- m -page printing page from printing data. Since when performing the n section printing at this time performs 1- m -page printing continuously n times, each printing page becomes each printing time of t_1-t_m .

[0106] Next, in Step S703, numbering of the sequence which repeated even the m -th page n times from the 1st page is carried out to the distribution sequence P_1-P_{mn} , each printing time is set to $T_{p1} - T_{pmn}$, and it adds to the value of the distribution sequence j one time at Step S704.

[0107] Next, in Step S705, the addition printing time (S_1-S_k) of the k printing sections is compared, and it asks for S_{α} with the shortest printing time.

[0108] Next, the printing data of P_{α} are assigned to the printing section of eye alpha watch have S_{α} in Step S706. When the value of S is the same, priority is given from the small printing section of alpha, and you may make it assign here.

[0109] Next, in Step S707, the printing time T_{pj} of P_j is added to S_{α} , and addition printing time S_{α} of the printing section alpha is updated.

[0110] Next, in Step S708, using the updated addition printing time (S_1-S_k), the same operation (S704-S707) is repeated until allotment of all pages is completed.

[0111] Next, in Step S709, if allotment of all pages is completed, the maximum addition printing time S_{\max} will be found. Moreover, each printing section searches for the differences D_1-D_k with the maximum addition printing time by the following formula, and is assigned to the tail end of the printing data of each printing section.

[0112] The sequence assigned to the $D_{\alpha}=S_{\max}-S_{\alpha}$ last by each printing section in Step S710 is reversed, respectively so that D_{α} may become a head, and final distribution sequence is acquired.

[0113] As explained above, although a printing start page and printing start time are not paginal order, since printing end sequence and printing end time are made by paginal order and a standby time does not produce them, according to the control method of the multilayer printer concerning the gestalt 6 of operation of this invention, printing distribution is performed efficiently.

[Gestalt 7 of operation] The points which control whether a user chooses how to distribute printing data although fundamental composition and fundamental operation are the same as that of the gestalt 1 of

operation mentioned above, or how to distribute the optimal printing data is chosen automatically by this operation gestalt 7 differ.

[0114] Below, the above-mentioned control method is explained, referring to drawing 6 and flow chart drawing 20.

[0115] First, in Step S581, the printing mode of the mode selection section 403 is set as a default. A user sets up beforehand which printing mode is set as a default, and the printer is made to memorize it here.

[0116] Next, in Step S582, if printing mode is chosen in the mode selection section 403, it will be changed into the printing mode in which printing mode was chosen. In this example, it has the speed priority mode (S583) which performs printing processing of the operation gestalt 4, the middle mode (S584) in which printing processing of the operation gestalt 3 is performed, and the power-saving mode (S585) in which printing processing of the operation gestalt 2 is performed, as printing mode.

[0117] Next, in Step S586, when operation of others, such as a monitor configuration, is carried out by the control unit 101, it processes according to operation (S587).

[0118] Next, in S588, when printing data are not sent to the control section, it returns to S582, and when printing data have been sent to the control section, after printing according to the printing mode set up by S582 (S589) and completing printing, it returns to S582 and will be in the state waiting for a data input.

[0119] It becomes possible to choose how to distribute the optimal printing data for each printed matter to the printed matter with which the printing amounts of data for every page differ remarkably like [as explained above / according to the control method of the multilayer printer concerning the gestalt of operation of the 7th of this invention] the printed matter with which black and white or the color was intermingled, or the printed matter which does not have a big difference in the printing amount of data for every page.

[0120] [Gestalt 8 of operation] With this operation gestalt 8, although fundamental composition and fundamental operation are the same as that of the gestalt 1 of operation mentioned above, when the printing section unit 300 is used for a multilayer printer, the processings performed before the main flow of printing processing in the operation gestalt 2 or 7 differ.

[0121] Below, the above-mentioned procedure is explained, referring to flow chart drawing 21.

[0122] First, in Step S601, both the variable i of a printing section unit number and the variable n of a printing section number are set as initialization 1.

[0123] Next, in Step S602, when a control section detects wearing of a printing section unit and it is equipped with the printing section unit, in S603, the printing section unit i is set as the printing section n, adds 1 to the variable i of a printing section unit number (S604), and progresses to S605. When not equipped with the printing section unit, in S605, 1 is added to the variable i of a printing section unit number.

[0124] Next, in Step S606, when there is a printing section unit which is not checking wearing, it returns to (S606-NO) and S602, and when wearing of all printing section units is checked, (S606-YES) progresses to S607.

[0125] Next, in Step S607, the number of the printing section units with which the variable m showing the number of the printing sections was equipped at the multilayer printer is substituted.

[0126] As explained above, according to the control method of the multilayer printer concerning the form of operation of the 8th of this invention, it is printable by equipping no stages of a multilayer printer main part with the printing section (at least one needing to be equipped).

[0127] Moreover, it becomes possible to print in the printing section which has more than one by distributing printing data only to the stage in which it is equipped with the unit when a unit stops, or when a unit is removed by failure, the trouble, ink supplement, etc.

[0128]

[Effect of the Invention] Since the delivery unit is collected by one in the printer which has two or more printing sections according to the multilayer printer and its control method of this invention, KORETO work is lost and high-speed printing processing is attained.

[Translation done.]